TA+HIM

ISDN Terminal Adapter Module

User Manual

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1 Introduction

This documentation is valid for the product:

- TA+HIM Hardware version 1.0
  Software version V1.xxx or later

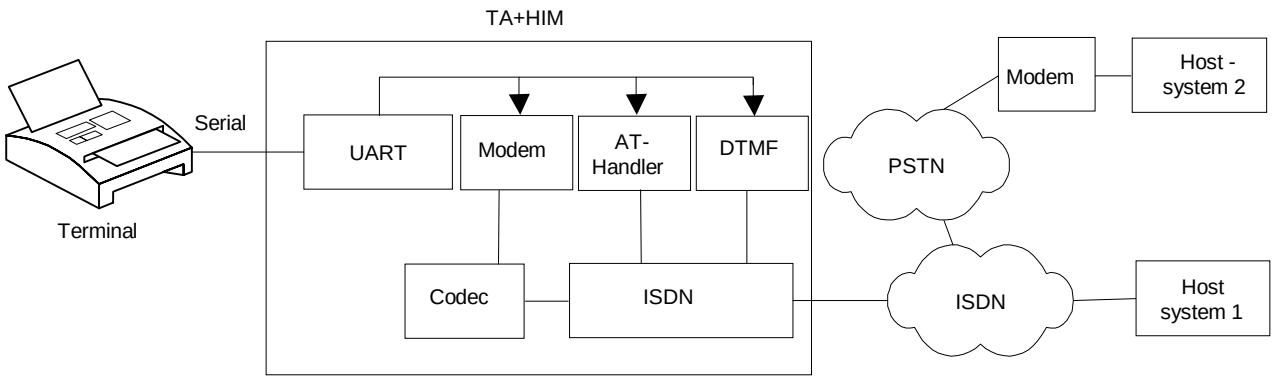
1.1 Product description

The TA+HIM is an ISDN terminal adapter with the following functions.
You can see it as a digital replacement for an analog modem.

- The TA+HIM connects devices with a serial communication port to the ISDN.
  It gives access to other devices connected to the ISDN or PSTN network .

- Data can be transmitted either over the D- or B-channel with the following rates:
  - by using the transmission method V.110 in B channel.
  - by using the transmission method V.120 in B channel.
  - by using the transmission method X.75 in B channel.
  - by using the transmission method PPP in B channel.
  - call a host connected to the X.25-network (X.25 in B or D channel).
  - call a host connected to an ISDN-X.31 subscriber line
  - by using analogue modem protocol in B channel:
    Bell 103, Bell 212, V21, V22, V.22bis, V.23, V.32, V.32bis, V.34, V.90, V.92.

- The connected device can drive the TA+HIM by using
  - asynchronous PAD (X.3) commands
  - asynchronous AT commands



To work with TA+HIM you need :

- an ISDN Basic Rate Interface (BRI) (replacing an analogue telephone line). The basic rate access can be ordered by your local telephone company or PTT
- a PC with a terminal emulation to configure the TA+HIM

1.2 License

The TA+HIM has the following license number for the connection to the PSTN:

CE-0682 X for Europe (EC), Switzerland, Norway.

TA+HIM is conform to the European safety requirements IEC 60 950. Connect the TA+HIM only to the BRA-interfaces with SELV (**S**afety **E**xtra **L**ow **V**oltage) related to EN60950.

The TA+HIM is conform to the European rules of EMC. EN50081-1, here EN55022 Class B, for electromagnetic field emission and EN50082-1 for emission of electromagnetic interference.

2 Installation

2.1 Interfaces

The TA+HIM has to be accessed via 2 interface connectors:

- P1: Communication interface to control the TA+HIM and power supply
- P2: Interface to the ISDN Network

A detailed description of the interfaces is given in the appendix.

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3 Using the TA+HIM

For the general mechanisms to use the TA+HIM please refer to the user manual for the TA+POX / TA+HUX / TA+SOC.

The global manual describes:

- Introduction of the TA+ products
- Installation and display elements of the TA+ products
- Description of the different command sets (AT-cmd, X.3 PAD, automatic call)
- Description of the TA+Configurator command set
- Diagnostic and error messages of the TA+ products.

The following chapters will describe the differences to the TA+POX / TA+HUX / TA+SOC and the product specific properties.

3.1 Analogue modem properties

The following section describes the functionality of using the analogue modem onto the TA+HIM module.

The modem chip “CONEXANT CX06833-44” is placed onto the bottom side of the TA+HIM module.

The serial interface of the modem chip is connected behind the processor system of the TA+HIM module. Serial data commands to the modem chip needs to be sent through the command interface of the ISDN module first.

The analogue modem interface is connected to the integrated Codec (MC 145481) onto the TA+HIM module.

With the exception of the command **A/** (Repeat command) all commands begin with the prefix **AT** and are terminated with <↵> (0x0D). Corrections in a command line are done with <BACKSPACE>. A command line has a maximum of 80 characters. The command line is automatically cancelled by longer input. Blanks are ignored, capital / small letters are not significant.

To enter the AT command mode during an active data connection you must use the following sequence ("Escape sequence"):
1. <delay time according to S12 register>
2. **<+><+><+>**
3. <delay time according to S12 register>
The time gap between all three plus signs may not exceed 1 sec.
The escape sequence is transmitted transparent to the remote device.

All configuration commands are sent to the AT command interpreter of the ISDN module (TA+HIM) as default.
To send configuration commands directly to the CONEXANT modem chip you have to set a separator [!] between the [AT] sequence and the specific command.

AT**!**<command>

All modem specific configuration commands are listed in a separate document from CONEXANT (AT Commands for CX81801 SmartV.XX, CX06833 SMXXD, CX81300 SmartACF, and CX06827 SCXXD Modems).
A sample of the most required modem commands are also described in this document in the following chapter.

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3.2 Special analogue modem commands

This chapter describes special commands related to analogue modem connectivity.

The connection control to establish an active connection, accept incoming calls or disconnect an existing connection is the same than for ISDN data connections.

An incoming analogue modem call will be accepted from the TA+HIM module independent of the current configured B-channel protocol.
Incoming calls can suppressed when setting the incoming msn-value “AT**msni= - “.

!<command>	command prefix for onboard CONEXANT modem configuration commands

When sending the additional <!> character between the AT prefix and the specific configuration command the command will be transferred directly to the onboard CONECANT modem chip.

All modem specific configuration commands are listed in a separate document from CONEXANT (AT Commands for CX81801 SmartV.XX, CX06833 SMXXD, CX81300 SmartACF, and CX06827 SCXXD Modems).

Example:

AT!i3	CONEXANT Modem ID “CX81802-V90”
AT!+MS=V32B	set modulation selection to V.32bis

B	B channel protocol

Transmission protocol for data communication in the B channel.
AT44 : analog

Incoming analogue calls will be accepted as modem call (ATB44) independent of the preconfigured B-channel protocol.

3.3 AT commands related to the prior product “TA+HIT”

AT****VMSN=** <msn value> Define own msn

Defines the msn *nn* (multiple subscriber number) for incoming calls “msni” and outgoing calls “msno” for the data port.
(compare: manual TA+POX/TA+HUX/TA+SOC)

If the number is set to “*“ (default), all incoming calls are acceptable.
Both values “msni” and “msno” will be displayed by command AT&V.

AT∗∗VMSN=*nn* set parameter "msni" and "msno" to *nn*
max. length = 20 digits

Note: If 1TR6 D channel protocol is selected, only one or the last digit is valid.
This parameter is not saved automatically.

AT∗∗VMSN needs two saving procedures. It will save the value “msni” and “msno” separately. This parameter will not saved automatically.

ATS70=<0/1> enable codec port for ATB40 only

This parameter enables or disables the CODEC on the TA+HIM hardware and changes the structure of the serial data output (“**:$”** or “**:1**”).
Depending of the value in ATS70 the incoming call will message an IOM call (:$RINGIxDxxxOxxxB0x) or a CODEC call (:1RINGIxDxxxOxxxB0x).

ATS70=0 incoming call will be displayed as IOM calls (default).
Example: :$RINGI1D211O222B01

ATS70=1 incoming call will be displayed as CODEC calls
and enable the CODEC.
Example: :1RINGI1D211O222B01

When the command interface receive an ext. IOM command “**AT:$xxx**” or an CODEC command “**AT:$xxx**” the value for the data structure will be changed in this S-register will be changed automatically.

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3.4 B channel connection using the IOM interface

The following section describes the enhancements for driving B channel connections through the IOM interface connector (IOM1) or the .
All other commands and behaviour, making data connection and maintaining the module, is identical to the documentation of TA+POX and can be referenced at the corresponding user manual.

Every command is always answered by the ISDN-module; a following command may only be entered after a response has been received.

Every AT command that controlles a B channel connection without switching an on board device to the B channel is preceeded by a ":" and a dummy port number (always "**$**").

Example: "AT:$ CR D1234" ; Establish a connection.

Resultmessages to the commands are preceeded by ":$"

Example: ":$CONNECT..." ;Connection established

Every B channel connection is identified by a call reference "Call-Reference".
The call reference is created and reported by the ISDN module:

- incoming call: as parameter to the "RING" message
- outgoing call: as result to the "CR" command.

The call reference has to be released by the application:

- with the command "DISC".

All commands based on the same connection have to use the same call reference. More than one call reference can be active at a time.
The B channel information is reported from the TA within the parameter *Bxx*.

Supported commands:

AT:$ A I<*Call-Reference*> *Accept incoming call*

Using this command you can accept an incoming call, if automatic call acceptance is not set (Register "**ATS0" = 0). An incoming call is indicated by the result message "RING".

The Call-Reference is valid from the indication of an incomig call or the status change of an connect request til the given release command.

Example: "AT:$ A I1" Accept an incoming call for port 1

AT:$ CC I<*Call-Reference*> **D<*rn*..>** *Send destination address to the network*

Continue to send the destination address to the network (overlap dialling) after initiating an outgoing call (i.e. command AT:$CR) without complete destination address.

"I" selects Call-Reference, 1..9
“D” sets destination address (the dialing number).
<*rn*> ISDN number, string of digits, 1..22.

Example: "AT:$ CC I1 D2"
Continue for an existing ougoing call for port 1 to send the destination address "2" to the network.

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AT:$ CR [D<*rn*..>] [O<*rn*..>] *Connect Request to the network*

Initiate an outgoing call.
"D" sets destination address (the dialing number).
"O" sets origination address (own msn), optional.
<*rn*> ISDN number, string of digits, 1..22.
The TA module initiates an outgoing call request and reports the call reference.

Result message:
":$I<*Call-Reference* >"

Example: Command: "AT:$CR D234 O567"
Result: ":$I1"

Intiate an outgoing call for Port 1 with destination address 234 and origination address 567 (own msn), the call can be referenced using the call reference 1.

Note: The used B channel is reported via message "INFO" (option).

AT:$ CH I<*Call-Reference*> *Call Hold*

Hold the call which is addressed by *Call-Reference*.

Example: "AT:$ CH I1"
Intiate a call hold for the existing connection 1 for Port 1

AT:$ CA I<*Call-Reference*> *Call Retrieve*

Retrieve the call which is addressed by *Call-Reference*

Example: "AT:$ CA I1"
Intiate retrieve for the existing connection 1 for Port 1

AT:$ C3PTY I<*Call-Reference*> **IH**<*Call-Reference(HeldCall)*>
Pass into three party service

Pass into three party which is addressed by the call reference's
Note: The further on used B channel is that one from the active connection.

Example: "AT:$ C3PTY I1 IH2"
Intiate a 3 party conference.

To release a three party conference please enter the same command again, then the previous state will be entered: Call on call reference **Ixx** will be active, call on the call reference **IHxx** will be in hold.

If one of the other two party of the three party conference is going on hook, the previous state for the staying connection will be entered. Example: if the previous active connection releases the connection within the three party conference, the three party conference will be closed and the staying connection will be in hold state.

AT:$ #C I<*Call-Reference*> *Received bearer service*

Shows the bearer service that is received with an incoming call in hexadecimal coding *hbhb*.
The value for *hbhb* (word) is the CIP value as defined in the CAPI 2.0 specification.
Example: Command "AT:$#C I1"
Result "0010" ; Receved bearer service

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AT:$ DISC I<*Call-Reference*> [C<*hb*>] *Disconnect*

Disconnects existing ISDN connection within the given cause value *hb* (hexadecimal coded byte).
The causevalue *hb* is defined according to Q931/ETS 300 102-1.
It is also possible to send an disconnect without an cause value (normal call clearing).
The *Call-Reference* is released by this command and is no longer valid.

Example: "AT:$ DISC I1"
Disconnect an existing connection with normal call clearing.
Example: "AT:$ DISC I1 C11"
Disconnect an incoming call with the cause 0x11 (User busy).

AT:$ RA **I**<*Call-Reference>* *Send alert message*

Send an Alert message to the network for the call that is addressed by *Call-Reference.*

Example:
AT:$ RAI1 Initiate an alert request for an existing incoming call for port 1.

3.4.1 AT result messages

All messages sent from the codec port of the TA+HIM are preceeded by an ":$".
There are no spaces between the different parameters of the messages.

:$ CONNECT I<*Call-Reference*> **D<*rn*..> O<*rn*..> B<*hb*>**
Connection established

Indicates that the connection with the remote side is established using *Call-Reference*.

"D" shows destination address (the dialled number).
"O" shows origination address (the dialling number).
"B" shows B channel used (hexadecimal coded byte):
01 = B channel 1 occupied.
02 = B channel 2 occupied.
<rn> ISDN number, string of digits, 1..22.

Example: ":$CONNECTI1D234O567B01"
Indicates a connection for Port 1 with destination address 234 and origination address 567 and using B channel 1.

:$ DISC I<*Call-Reference*> C<*hbhb*> *disconnect received*

Indicates that a call has been disconnected.
The cause is indicated with causevalue *hb* (hexadecimal coded word).
The causevalue hb is defined according to CAPI 2.0 (see also TA+POX manual CAPI-causes).

Example: ":$DISCI1C3491"
Outgoing call is cleared with the ISDN cause 0x91 (User busy).

:$ INFO I<*Call-Reference*> **D<*rn*..>** *information to existing call reference*

Information initated by a status change for an existing call reference with:

"D" shows destination address (the dialled number).

Example: ":$INFO I1D9" next dialled number "9" received.

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:$ INFO I<*Call-Reference*> **B<*hb*>** *information to existing call reference*

Information initated by a status change for an existing call refence with:

"B" shows B channel used (hexadecimal coded byte):
- 00 = no B channel occupied.
- 01 = B channel 1 occupied.
- 02 = B channel 2 occupied.

Example: ":$INFO I1B01"

:$ RING I<*Call-Reference*> **D<*rn*..> O<*rn*..> B<*hb*>** *incoming call*

Indicates an incoming call, a SETUP is received.
"D" shows destination address (the dialled number, = dialled msn).
"O" shows origination address (the dialling number).
"B" shows B channel used (hexadecimal coded byte):
- 00 = no B channel occupied (if call waiting and both B channels occupied).
- 01 = B channel 1 occupied.
- 02 = B channel 2 occupied.
- <*rn*> ISDN number, string of digits, 1..22.

Example: ":$RINGI1D234O567B01"
Indicates an incoming call for port 1 with destination address 234 and origination address 567 and using B channel 1.

Note: This message is repeated (like in AT modems).

:$ CRA I<*Call-Reference*> *call request accepted*

Indicates that the call request is accepted.

Example: ":$CRAI1"

:$ RINGING I<*Call-Reference*> *called party is ringing*

Indicates that the call request is accepted at the called party and a ringing is issued.

Example: ":$RINGINGI1"

Note: This message is not repeated (like in AT modems).

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3.4.2 Call control examples

3.4.2.1 Outgoing data call and disconnect

AT application		TA+HIM module	Remarks
"ATB10"	**à**		Select b-channel protocol
	ß	"OK"	OK
"ATD123"	**à**		Initiate outgoing call to 123
			Destination is ringing, accept call with "ATA"
	ß	"CONNECT 64000"	Connection established
"+++"	**à**		Change into local command mode
	ß	"OK"	OK
"ATH"	**à**		Disconnect call
	ß	"OK"	OK

3.4.2.2 Outgoing voice call and disconnection over IOM interface

AT application		TA+HIM module	Remarks
"ATB40"	**à**		Select ext. IOM connection
	ß	“OK“	OK
“AT:$CRD123”	**à**		Initiate outgoing call to 123
	ß	“:$CRAI1B01“	Call request accepted
	ß	“:$RINGINGI1”	Destination is ringing
			Destination accept call
	ß	“:$CONNECTI1D123O234B01“	Connection established
“AT:$DISCI1”	**à**		Disconnect call
	ß	":$OK"	OK
	ß	":$RELI1C”	Call released

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3.4.2.3 Accepted incoming voice call over IOM interface

AT application		TA+HIM module	Remarks
“AT#C2=00000001”	à		Select bearer service incomming, accept all incomming calls
“RING”	ß		Incomming call to TA+HIM, destination is dialling
“AT#C”	à		Check received bearer service, select for voice or data calls
	ß	“0004“	0001 : Speech 0002 : Data 0004 : 3,1 kHz Audio 0010 : Telephony
"ATB40"	à		Select ext. IOM connection
	ß	“OK“	OK
“AT:$RAI1”	à		Send alert message
	ß	“:$RINGI1D300O310B01“	Ringing
	ß	“:$OK“	
“AT:$AI1”	à		Accept incomming call
	ß	“:$CONNECTI1D123O234B01“	Connection established
			Destination disconnect, i.e. go onhook
	ß	":$RELI1C3490”	Call released, normal clearing

3.4.2.4 Call hold handling

AT application		TA+HIM module	Remarks
"ATB40"	**à**		Select ext. IOM connection
	ß	"OK"	OK
"AT:$CRD123"	**à**		Initiate outgoing call to 123
	ß	":$CRAI1B01"	Call request accepted
	ß	":$RINGINGI1"	Destination is ringing
			Destination accept call
	ß	":$CONNECTI1D123O234B01"	Connection established
"AT:$CHI1"	**à**		Put activ connection in hold
	ß	":$HOLDI1"	Connection I1 is in hold
"AT:$CAI1"	**à**		Retreive the hold connection
	ß	":$OK"	OK
"AT:$DISCI1"	**à**		Disconnect call
	ß	":$OK"	OK
	ß	":$RELI1C"	Call released

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3.5 Using TA+HIM with DTMF detection

This commands enables the DTMF recognizing mechanism for DTMF signals on the B channel from the ISDN line (AT**RCVDTMF=1).
The DTMF recognition is valid on the serial interface if B channel protocol is set to transparent (ATB5) or over the external IOM interface with the B channel protocol ATB40. The presentation of received data should be disabled (AT**RCVDATA=0).
Detected and valid received DTMF signals are presented via the V.24 interface using the following syntax inside the V.24 data stream.

RCVDATA Disable receiving B channel data

This command disables the presentation of B channel data received from the ISDN line via the V.24 interface.

AT**RCVDATA=0 disable receive data from the ISDN line
ATRCVDATA=1** enable receive data from the ISDN line

RCVDTMF Enable interpretation of DTMF signals

(only valid for ATB5)
ATRCVDTMF=0** disable DTMF recognition
AT**RCVDTMF=1 enable DTMF recognition

The received DTMF tones are presented in the following way:
<DLE> 1 key “1” pressed by the connected phone
<DLE> 2 key “2” pressed by the connected phone
<DLE> x key “0, … 9” pressed by the connected phone
<DLE> * key “*” pressed by the connected phone
<DLE> # key “#” pressed by the connected phone

<DLE> is presented as hex value 0x10.

4 Appendix

A1: Technical data TA+HIM

One serial channel for data communication and connection control:

functional:	V.24
electrical:	TTL
mechanical:	dual pin rows

one audio interface for voice:

input:	typical 750 mV_{pp}
output:	typical 750 mV_{pp} , R_L > 2000 Ohm

Data transmission speeds:

DTE:	1200 – 230400 bit/s (asynchronous)
B channel:	2 x 64000 bit/s (synchronous)
Modem:	Bell 103, Bell 212, V21, V22, V.22bis, V.23, V.32, V.32bis, V.34, V.90, V.92

Character representation:	8Bit no Parity, 1 stop bit 7Bit even/odd Parity, 1 stop bit
Character synchronization:	asynchronous
Operating mode:	half duplex or full duplex
ISDN interface:	BRA-interface according to ITU I.430
Power supply:	+5V ∀5%, nominal: app. 60 mA, (max 110 mA) idle: app. 25 mA.
Physical dimensions:	plug on module: 56 x 56 x 12 (8) mm (WxDxH)

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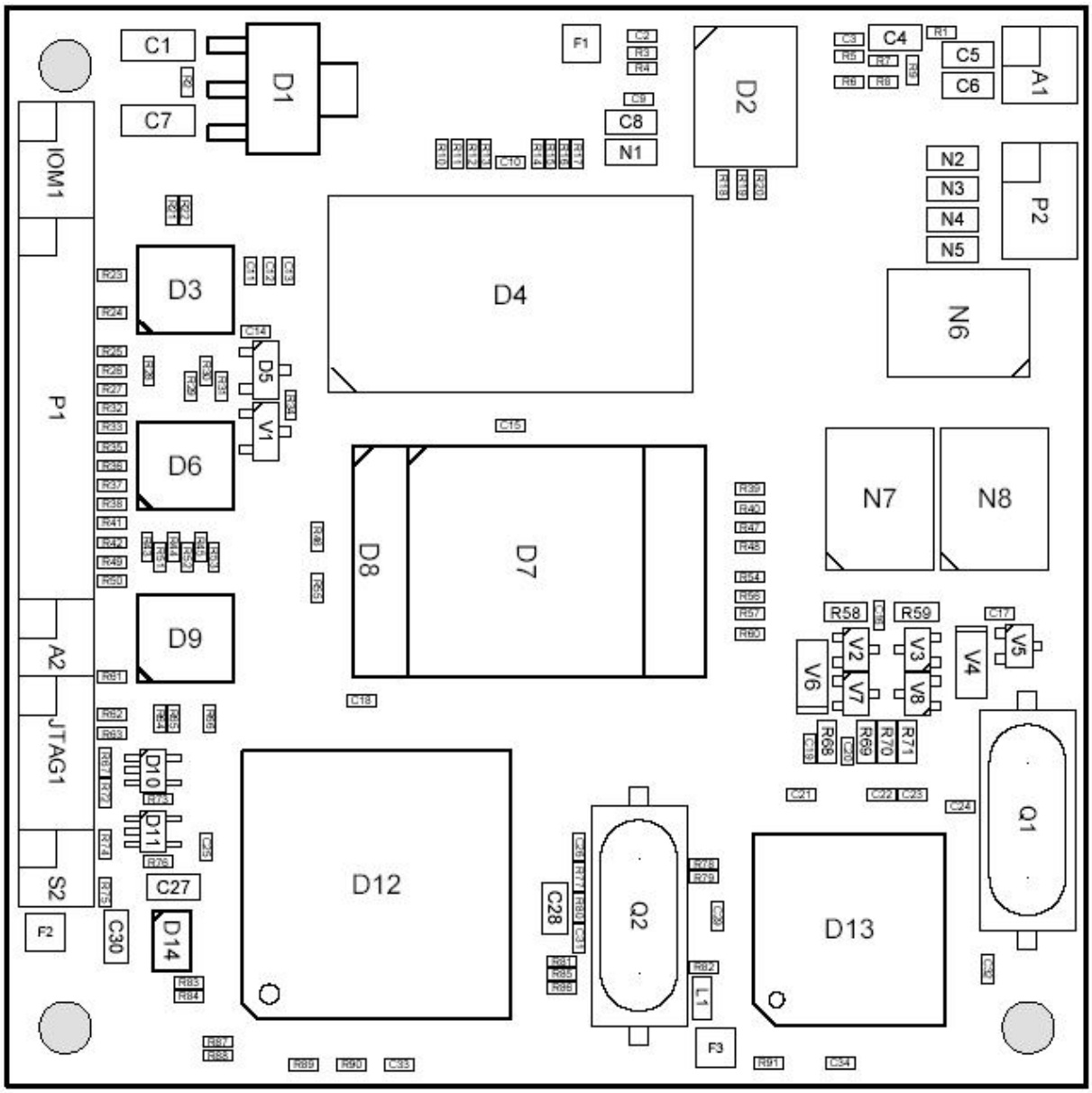
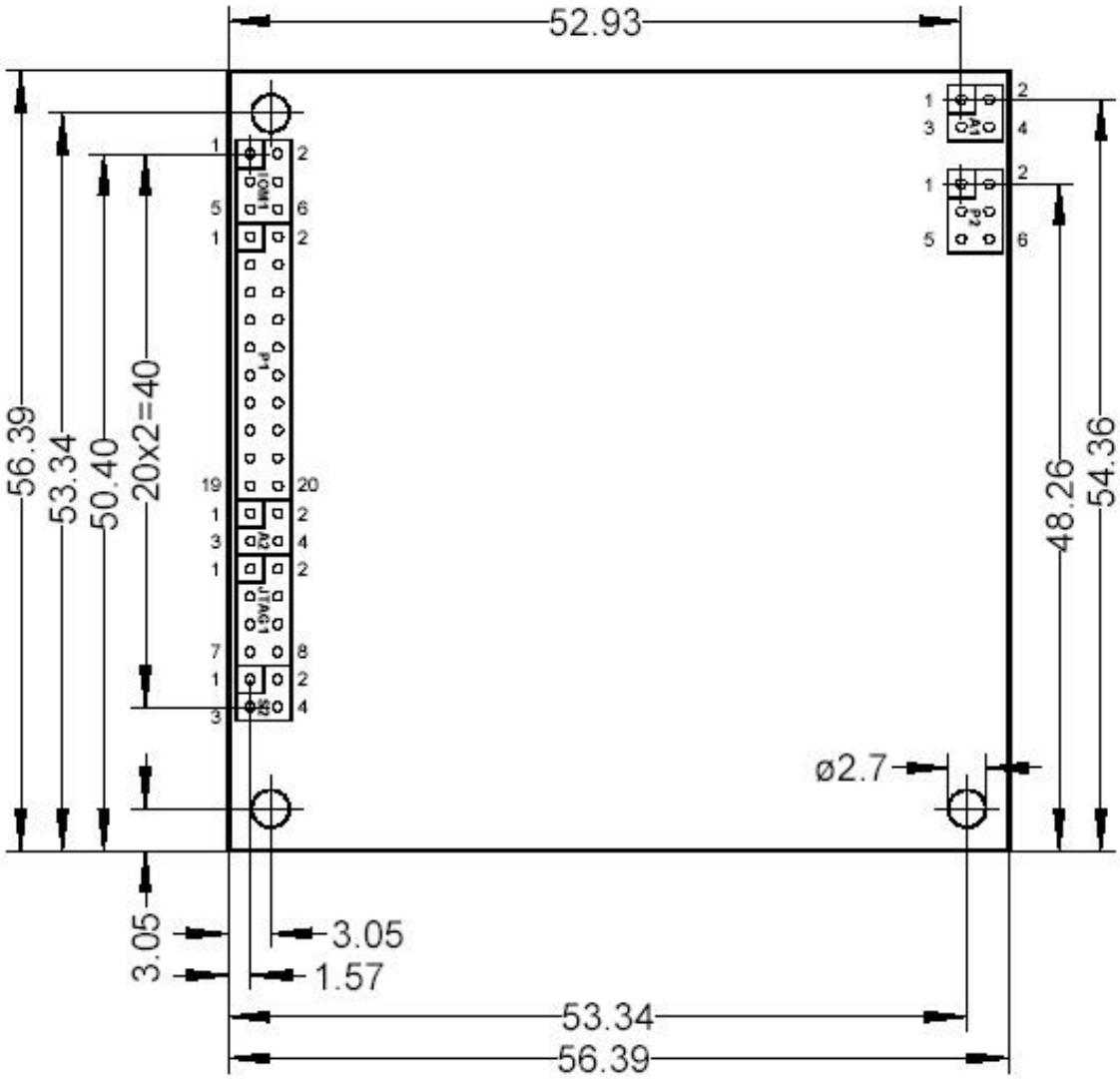
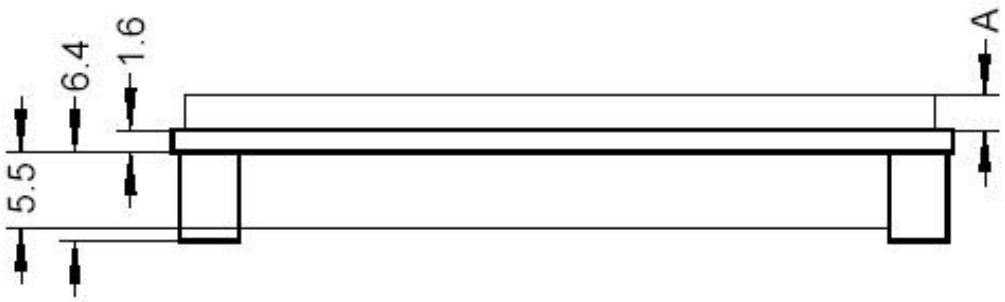
A2: Mechanical dimensions of the module TA+HIM







	A
without Modem	< 1mm
with Modem	< 2.5 mm

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A3: TA+HIM Serial Interface Connector P1

P1-Pin	Signal	Direction from TA+HIM	TA usage	External interfacing
1	GND	I	0V-Power	0V Power supply
2	VCC	I	+5V-Power	+5V Power supply
3	GND		GND	GND
4	TXD	I		
5	GND		GND	GND
6	RXD	O		
7	ID2	O	GND on TA+HIM	NC or READ
8	RTS	I		
9	ID1	O	10k Pull up on TA+HIM	NC or READ
10	CTS	O		
11	RESET	I	RESET active low OC	NC
12	DTR	I		
13	L3	O		NC or status info
14	DCD	O		
15	RI	O		
16	DSR	O		
17	UA	O	User Output 1	NC or status info
18	UE	I	User Input 1	NC, reserved
19	UA2	O	User Output 2	NC, reserved
20	UE2	I	User Input 2	NC, reserved

A4: TA+HIM ISDN interface Connector P2

P2-Pin	Signal	Direction	RJ-45-Pin
1	RX-	I	5
2	TX-	O	6
3	RX+	I	4
4	TX+	O	3
5	RX (BRA-power supply)	O	NC
6	TX (BRA-power supply)	O	NC

A5: TA+HIM interface Connector IOM1 (option)

IOM1-Pin	Signal	Direction from TA	TA usage
1	DD	O	IOM Data downstream
2	DU	I	IOM Data upstream
3	FSC	O	IOM frame sync
4	DCL	O	IOM double bit clock
5	SDS	O	IOM B channel strobe
6	BCL	O	IOM bit clock

A6: TA+HIM interface Connector JTAG1 (option)

JTAG1-Pin	Signal	TA usage
1	TDI	Serial data in
2	TDO	Serial data out
3	TMS	TAP mode select
4	RES	Target System reset
5	TCK	Clock
6	GND	Signal Ground
7	TRST	TAP reset
8	VCC	3,3 V

A7: TA+HIM serial interface Connector S2 (option)

S2-Pin	Signal	Direction
1	NC	
2	TXD	I
3	GND	
4	RXD	O

A8: Pinout of the ISDN S-interface connector (RJ45) (CCITT I.430/ISO 8877)

Pin	Signal (BRA)
1	Not connected
2	Not connected
3	Tx+ (Transmit +)
4	Rx+ (Receive +)
5	Rx- (Receive -)
6	Tx- (Transmit -)
7	Not connected
8	Not connected

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